

Decision Support Systems (DSS), including systems that include incorporation of Geographic Information Systems (GIS) and knowledge bases, have become critical tools in water planning processes. These systems can provide guidance to water interests in a manner that can be understood across disciplines, and enables water interests to explore alternative water management scenarios that can lead to “win-win” solutions.

Development of a DSS that reflects the priorities, data, and understanding of the various water interests involved in collaborative water planning and policy processes can be challenging. In many cases, the mechanics of DSS development may be approached with a high level of understanding of the technical aspects of programming and modelling, but with a lower level of understanding of the concerns of the water interests involved and user preferences. Capturing and representing local interests, understanding, and priorities within a DSS is an important step towards ensuring “buy-in” for the use of that system.

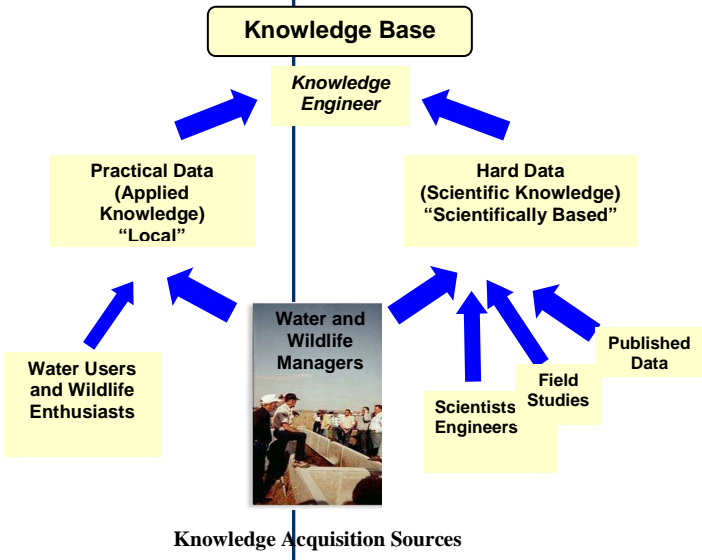
Watercat Consulting LLC supports clients in the development of DSS that can more fully reflect input from water interests involved in a planning process, including:

- Initial communications with watershed interests to identify DSS components to be included
- Identification of criteria and approaches to representation of criteria within the DSS
- DSS verification, validation and user testing
- Presentation of DSS results in a format accessible and comprehensible to a broad range of target audiences.

Project examples include:

- South Platte (Colorado) Collaborative Ground Water Recharge & Habitat Planning Decision Support Tool
- Wetland Functionality and Compensation Assessment Tool (WFCAT)

South Platte (Colorado) Collaborative Ground Water Recharge & Habitat Planning Decision Support Tool



Watercat Consulting LLC staff developed a GIS-based biological module and Excel-based waterfowl habitat and recharge feasibility analysis rules for the GIS-based South Platte Mapping and Analysis Program. Decision support tool development tasks completed included Initial communications with watershed interests to identify DSS components; Identification of criteria and approaches to representation of criteria within the DSS; DSS verification, validation and user testing; and Presentation of DSS results in a format accessible and comprehensible to a broad range of target audiences.

The project was developed jointly for the Colorado Division of Wildlife and South Platte Lower River Group water users' coalition. This system, which incorporated results into a narrative describing the benefits and challenges associated with each site evaluated, provided a transparent knowledge-based system for the evaluation of potential pond sites for groundwater recharge for streamflow augmentation, pond development costs, and waterfowl habitat benefits. This system was developed to support coordination of habitat development activities by federally-funded habitat partnership programs and members of the South Platte Lower River Group to further the integration of habitat benefits into the development of private managed ground water recharge facilities. Members of the South Platte Wetlands Focus Area Committee also contributed to the development of the knowledge base and testing of the system.

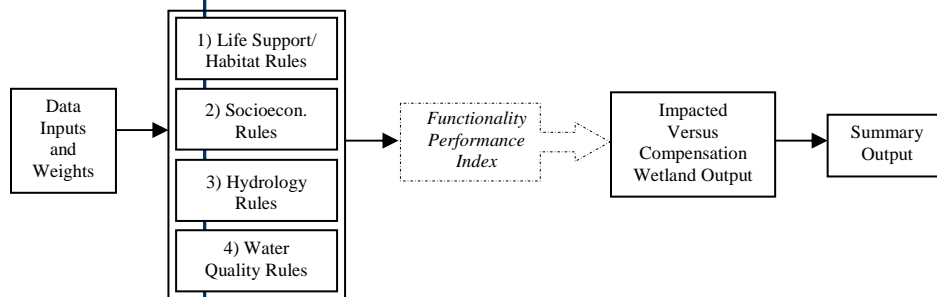
Waterfowl Habitat Assessment Tool Rule Base									
Row	Subriterion	Threshold	Score	Quality	GIS Link	Weight	GIS Link	Weight	Score
1	The following subriterion rules are used to produce the pond site assessments for the waterfowl habitat potential component. The threshold values used for each rule and the radius of the areas of evaluation, shown in light yellow boxes can be changed on this page. Items in blue yellow boxes require links to GIS coverages and tools.								
7	Subriterion 1a: Flood Disturbances	0 0 to 0.5 miles away	1	Poor					
8		0.5 0.5 to 1 miles away	2	Fair					
9		1 1 to 2 miles away	3	Good					
10		2 2 miles or more away	4	Excellent					
11	Subriterion 1b: Town (Human) Disturbances	0 0 to 0.5 miles away	1	Poor					
12		0.5 0.5 to 1 miles away	2	Fair					
13		1 1 to 2 miles away	3	Good					
14		2 2 miles or more away	4	Excellent					
16	Subriterion 2a: Year Round Open Water	0 0 to 10%	1	Poor					
17		10 10 to 20%	2	Fair					
18		20 20 to 30%	3	Good					
19		30 30% or more	4	Excellent					
21	Subriterion 2b: Breeding Open Water	0 0 to 10%	1	Poor					
22		10 10 to 20%	2	Fair					
23		20 20 to 30%	3	Good					
24		30 30% or more	4	Excellent					
26	Subriterion 2c: Spring Migration Open Water	0 0 to 20%	1	Poor					
27		20 20 to 30%	2	Fair					
28		30 30 to 40%	3	Good					
29		40 40% or more	4	Excellent					
30	Subriterion 2d: Fall Migration Open Water	0 0 to 10%	1	Poor					
31		10 10 to 20%	2	Fair					
32		20 20 to 30%	3	Good					
33		30 30% or more	4	Excellent					
36	Subriterion 3a: Percent Carbonaceous Food Source	0 0 to 10%	1	Poor					
37		10 10 to 20%	2	Fair					
38		20 20 to 30%	3	Good					
39		30 30% or more	4	Excellent					
41	Subriterion 3b: Percent Protein Food Source	0 0 to 10%	1	Poor					
42		10 10 to 20%	2	Fair					
43		20 20 to 30%	3	Good					
44		30 30% or more	4	Excellent					
46	Subriterion 4: Percent Protected Lands	0 0 to 10%	1	Poor					
47		10 10 to 20%	2	Fair					
48		20 20 to 30%	3	Good					
49		30 30% or more	4	Excellent					

The system included a weighted average multi-criteria decision analysis as reasoning engine for a knowledge-based system to evaluate potential ground water recharge sites for stream augmentation. Designed to operate in Excel, a program with which local water interests involved in planning decisions were familiar, the Comprehensive Pond Site Assessment Model was linked to GIS for data collection and spatial analysis. As users modified the threshold values for each rule to be included in the evaluation, data for any spatially-based component of that rule would be updated through a link with GIS files to determine the updated results.

Wetland Functionality and Compensation Assessment Tool (WFCAT)

Watercat developed a prototype Wetland Functionality and Compensation Assessment Tool (WFCAT) as a conceptual design to support the assessment, comparison, and compensation benefit associated with wetlands impacted by development activities and alternative compensation wetland sites. WFCAT was also developed to support evaluation of compensation determinations at sites where opportunities for wetland impact avoidance and minimization has already been fully utilized, and evaluation of potential wetland sites for development as compensation for impacted wetlands.

The WFCAT conceptual design was developed for a wetland trust with expert interviews conducted with Ducks Unlimited personnel for habitat rules and other water resources professionals for water quality, hydrology, and socioeconomic rules. WFCAT was conceptually designed as a knowledge-based system, integrated with multi-criterion decision analysis and geographical information systems into a framework that would be easy to use and modify.



WFCAT has four modular components and the assessment provided by each component can be combined to yield an overall site assessment for a pair of compared sites: an impacted site and a compensation site. Those components evaluate wetland values and functions according to the previously presented aspects, in order to synthesize the historically considered aspects for wetland mitigation into four general groups:

- 1) life support/habitat
- 2) socioeconomic
- 3) hydrology, and
- 4) water quality functions.

The "function priority weight" of the wetland function is an indication of the priority given to each of the functions and values assessed. All functions and values are initially assumed to be equal (with a weight of one). If certain functions or values are determined to have a higher priority for wetland conservation and compensation, then those function priority weights are considered when calculating the average functional area of the sites. The original area of the wetland is then recalculated as an "equivalent functional area" which represents the area of the wetland site that is capable of supporting a given function.